

#### Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

#### Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the detailed hydraulic analyses are shown within this zone.

#### Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No BFEs or depths are shown within this zone.

#### Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

### **6.0 FLOOD INSURANCE RATE MAP**

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot BFEs or average depths. Insurance agents use the zones and BFEs in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100- and 500-year floodplains, floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

The countywide Flood Insurance Rate Map presents flooding information for the entire geographic area of Lancaster County. Previously, Flood Insurance Rate Maps were prepared for each incorporated community and the unincorporated areas of the County identified as floodprone. This countywide Flood Insurance Rate Map also includes flood-hazard information that was presented separately on Flood Boundary and Floodway Maps, where applicable. Historical data relating to the maps prepared for each community are presented in Table 6, "Community Map History."

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISION DATE(S)	FLOOD INSURANCE RATE MAP EFFECTIVE DATE	FLOOD INSURANCE RATE MAP REVISION DATE(S)
Bennet, Village of	April 25, 1975		March 2, 1981	
Davey, Village of	September 21, 2001		September 21, 2001	
Denton, Village of	September 21, 2001		September 21, 2001	
Firth, Village of	November 8, 1974		April 15, 1981	
Hallam, Village of	September 21, 2001		September 21, 2001	
Hickman, City of	November 8, 1974		February 3, 1982	
Lincoln, City of	April 27, 1971		April 27, 1971	July 1, 1974 September 3, 1976 November 7, 1980 March 18, 1986 August 16, 1988 June 19, 1997
Malcolm, Village of	September 21, 2001		September 21, 2001	
Panama, Village of	September 21, 2001		September 21, 2001	
Raymond, Village of	August 3, 1981		August 3, 1981	
Roca, Village of	September 21, 2001		September 21, 2001	
Sprague, Village of	November 1, 1984		September 21, 2001	
Waverly, City of	December 17, 1973		April 15, 1982	
Unincorporated Areas	February 28, 1978	December 26, 1975	February 3, 1982	

## **7.0    OTHER STUDIES**

Previous Flood Insurance Studies were prepared for the Cities of Hickman and Lincoln; the Villages of Bennet, Firth, Raymond, and Waverly; and the unincorporated areas of Lancaster County (References 43, 13, and 44 through 48, respectively). In addition, Flood Insurance Studies were prepared for Saunders and Cass Counties, Nebraska (References 49 and 50). The above-listed Flood Insurance Studies were in agreement.

There is a Flood Plain Information Report by the USACE for portions of Lancaster County (Reference 5).

The NRCS completed a Watershed Work Plan for the Upper Big Nemaha Watershed in February 1965 (Reference 14). The hydrology from that plan was coordinated with the original study for the Village of Firth. The NRCS also completed a Watershed Work Plan to evaluate land treatment and floodwater retention structures in the Little Nemaha River basin (Reference 25). The hydrology from that plan was coordinated with the original study for the Village of Bennet.

The original Flood Insurance Study for the City of Lincoln superseded three Flood Plain Information Reports for the Lincoln Metropolitan Region (Reference 5).

No previous studies have been prepared for the Villages of Davey, Denton, Hallam, Malcolm, Panama, Roca, and Sprague.

This report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the NFIP.

## **8.0    LOCATION OF DATA**

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting FEMA, Mitigation Division, Federal Office Building, 2323 Grand Boulevard, Suite 900, Kansas City, Missouri 64108-2670.

## **9.0    BIBLIOGRAPHY AND REFERENCES**

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## 10.0 REVISION DESCRIPTIONS

This section has been added to provide information regarding significant revisions made since the original Flood Insurance Study was printed. Future revisions may be made that do not result in the republishing of the Flood Insurance Study report. To assure that any user is aware of all revisions, it is advisable to contact the community repository of flood-hazard data.

### 10.1 First Revision

#### City of Lincoln (Revised August 15, 1988)

The hydraulic analyses for this restudy were performed by the USACE, Omaha District. FEMA reviewed and accepted these data for purposes of this restudy. Topographic data for the Colonial Hills area were furnished by the City of Lincoln.

Flood delineations around Holmes Lake were revised as a result of the new hydraulic analyses. The Special Flood Hazard Area and floodway delineations for Antelope Creek were revised from Holmes Lake Dam to approximately 2,100 feet upstream of 70th Street. The Flood Profile and Floodway Data Table for Antelope Creek were revised to reflect the changes in the hydrologic and hydraulic conditions.

The HEC-2 computer program was used to perform the hydraulic analysis for Holmes Lake (Reference 36). As a result of the revised analysis, the BFEs were changed from an elevation of 1,246 feet NGVD to an elevation of 1,255 feet NGVD. The backwater elevation for Antelope Creek was increased to show the higher elevation for Holmes Lake. The 100- and 500-year flood boundaries along Holmes Lake and Antelope Creek were redelineated using USGS topographic maps (Reference 28) and supplemental topographic maps provided by the City of Lincoln (Reference 51).

### 10.2 Second Revision

#### City of Lincoln (Revised June 19, 1997)

The hydrologic and hydraulic analyses for Deadman's Run were performed by the USACE, Omaha District, for FEMA, under Interagency Agreement No. EMW-92-E-3839. FEMA reviewed and accepted these data for the purposes of this revision. The final coordination meeting was held on July 28, 1994. As a result of comments received from the community, street names and corporate boundaries were updated.

A detailed study was performed for Deadman's Run from the confluence with Salt Creek upstream to A Street, a distance of approximately 5.6 miles. This area was previously studied by approximate methods.



The discharges for the 100- and 500-year flood frequencies were developed using the Environmental Protection Agency SWMM as modified by the USACE, Missouri River Division (Reference 17). The 10- and 50-year discharges were computed from the 100-year discharges based on a zero skew and a 0.35 standard deviation.

The computed discharges were based on a 6-hour storm duration. In addition, Wedgewood Lake, a small private impoundment with an uncontrolled outlet, was reflected in the hydrologic model through the use of a storage outflow relationship.

Peak discharges for the Deadman's Run basin are shown in Table 2, "Summary of Discharges."

Channel cross sections for the backwater analyses were obtained from as-built plans of the improved channel provided by the Lower Platter South NRD (Reference 52). Overbank portions of the cross sections were obtained from topographic maps provided by the City of Lincoln (Reference 53). Maps at a scale of 1"=200', with a contour interval of 5 feet, were combined and reduced to half size to produce the base map for the study. In some locations, additional cross sections were field surveyed in February 1989. Information on bridges and culverts was obtained from as-built plans and field inspection. Additional survey information was obtained at selected locations from various sources through the City of Lincoln (References 54 through 60).

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles and on the Flood Boundary and Floodway Maps.

Water-surface profiles were developed using the USACE HEC-2 computer program as modified by the USACE, Omaha District (Reference 61). Some bridge losses were determined using the HEC-2 normal bridge method. Loss calculations for the remainder of the bridges were determined using the Federal Highway Administration bridge loss routines programmed into the HEC-2 program by the USACE, Omaha District (Reference 37).

Roughness coefficients (Manning's "n" values) for this restudy were determined by field inspection and engineering judgment. Calibration data for roughness values were not available for Deadman's Run. Assigned roughness values ranged from 0.032 to 0.050 in the channel and from 0.012 (for paved areas) to 0.120 in the overbanks. For cross sections through structures, a roughness coefficient of 0.99 was assigned to that part of the cross section. Wedgewood Lake was assigned a roughness value of 0.022.

Coincident flow analysis showed severe drawdown conditions at the confluence of Deadman's Run with Salt Creek, resulting in critical depth. Because Deadman's Run is confined by the Salt Creek levee system in this area, it rapidly returns to normal depth flow.

Flood profiles were drawn showing the computed 100-year flood only.

The flood boundaries were delineated using the flood water-surface elevations determined at each cross section. Between cross sections, the boundaries were interpolated using maps at a scale of 1"=400', with a contour interval of 5 feet (Reference 53). The maps used were based on Lincoln City datum, which equals NGVD minus 1,099.34 feet. In cases where the

100- and 500-year floodplain boundaries are close together, only the 100-year boundary has been shown. Flood elevations for Salt Creek at the confluence with Deadman's Run are from a previous version of the Flood Insurance Study for the City of Lincoln (Reference 13).

A floodway has never previously been delineated for Deadman's Run. Based on the new hydraulic analysis, a 1-foot rise floodway was developed. The floodway was computed on the basis of equal conveyance reduction from each overbank of the floodplain. In some reaches, the stream was situated at the far left or right limit of the floodplain, so equal conveyance reduction was not possible. The results of these computations were tabulated at selected cross sections. This information is presented in Table 4, "Floodway Data." The floodway is shown on the Flood Boundary and Floodway Map. In cases where the floodway and 100-year floodplain are close together, only the floodway boundary is shown.

A Letter of Map Revision (LOMR) dated December 30, 1994, for Middle Creek was incorporated into this revision. The LOMR was issued to show the effects of channelization along Middle Creek, from approximately 1,500 to 3,000 feet and from approximately 7,700 to 8,700 feet upstream of its confluence with Salt Creek; the construction of Capitol Parkway West along the right overbank of Middle Creek; and the construction of the Salt Valley Roadway bridge. The Flood Insurance Rate Map, Table 4, "Floodway Data," and the Flood Profile for Middle Creek were revised as part of this LOMR.

Discrepancies in the distances between cross sections for Middle Creek shown on the profile and on the map were found during processing of this map update. These discrepancies occurred between Cross Sections E and F and Cross Sections G and H. In addition, the LOMR attachment did not show Cross Section L in the correct location. These discrepancies were corrected as part of this map update.

The alignment of the Antelope Creek box culvert was revised as part of this update based on comments from the community. The alignment shown on the maps is based on information about the existing culvert provided in the report entitled "Conditional Letter of Map Revision, Public Works/Utilities Department, Antelope Creek Box Conduit Project," dated August 1994. The alignment shown for the box culvert on the previous Flood Insurance Rate Map and Flood Boundary and Floodway Map was actually the hydraulic baseline for the HEC-2 computer model for the stream. The profile baseline label was added to the profile and maps.

The USACE published a report entitled "Lincoln Metropolitan Region Flood Plain Information for Antelope Creek, Deadman's Run and Middle Creek" in April 1966 (Reference 5). The information presented in that study for fully developed basin conditions is essentially compatible with this study.

### 10.3 Third Revision

This study was revised on September 21, 2001, to convert the Flood Insurance Rate Maps and Flood Insurance Study reports for Lancaster County and Incorporated Areas into the countywide format. In addition, the mapping for the new countywide Flood Insurance Rate Map was converted to digital format.

### Countywide Update

This update combined the Flood Insurance Rate Maps and Flood Insurance Study reports for Lancaster County and Incorporated Areas into the countywide format. Under the countywide format, Flood Insurance Rate Map panels have been produced using a single-layout format for the entire area within the County instead of separate layout formats for each community. The single-layout format facilitates the matching of adjacent panels and depicts the flood hazard area within the entire panel border, even in areas beyond a community's corporate boundary line. In addition, under the countywide format, this single Flood Insurance Study report provides all Flood Insurance Study information and data for the entire County area.

As part of this update, the format of the map panels has changed. Previously, flood-hazard information was shown on both the Flood Insurance Rate Map and Flood Boundary and Floodway Map. In the new format, all BFEs, cross sections, zone designations, and floodplain and floodway boundary delineations are shown on the Flood Insurance Rate Map and the Flood Boundary and Floodway Map has been eliminated. Some of the flood insurance zone designations were changed to reflect the new format. Areas previously shown as numbered Zone A were changed to Zone AE. Areas previously shown as Zone B were changed to Zone X (shaded). Areas previously shown as Zone C were changed to Zone X (unshaded). In addition, all Flood Insurance Zone Data Tables were removed from the Flood Insurance Study report and all zone designations and reach determinations were removed from the profile panels.

### Digital Conversion

The mapping for Lancaster County and Incorporated Areas has been prepared using digital data. Previously published Flood Insurance Rate Map data produced manually have been converted to vector digital data by a digitizing process. These vector data were fit to raster digital images of the USGS quadrangle maps of the County area to provide horizontal positioning.

Lancaster County has provided road and highway name and centerline data. The centerline data were computer plotted with the digitized floodplain data to produce the countywide Flood Insurance Rate Map.

As part of this digital conversion, the panel layout of the Flood Insurance Rate Map has been revised. The new layout for the Flood Insurance Rate Map was based on the layout of the USGS quadrangle maps of Lancaster County. Individual map panel scales were determined so that the flood data represented was at similar scale to that shown on the previously effective Flood Insurance Rate Map.

In addition, Table 6, "Community Map History," was added to the Flood Insurance Study report as part of this update.

### Letters of Map Change (LOMCs)

This update also incorporates the determinations of mappable LOMCs (i.e., Letters of Map Amendment and LOMRs) issued by FEMA for the projects listed in Table 7, "Letters of Map Change." Table 4, "Floodway Data," and Exhibit 1, "Flood Profiles," were revised to reflect changes as a result of incorporating this flood hazard information.

Table 7. Letters of Map Change

<u>Community</u>	<u>Case No.</u>	<u>Project</u>	<u>Flooding Source</u>	<u>Letter Date</u>
City of Hickman	96-07-064A	East Lawn Addition, Block 4, Lots 7, 8, and 9	Hickman Branch	January 16, 1996
City of Lincoln	90-07-25	Adventure Golf Center, 56 <sup>th</sup> and Old Cheney	Beal Slough	March 15, 1990
	91-70-18	Olde Mill Subdivision, Block 3, Lots 1 and 2		February 20, 1992
	94-07-261P	Van Dorn Project	Beal Slough	December 29, 1994
	96-07-093A	Woods Bros. Half Acres, the south half of Lot 65	Haines Branch	January 16, 1996
	96-07-310A	Wilmer's Addition, Outlot "A"	Antelope Creek	August 27, 1996
Unincorporated Areas	97-07-246P	New Housing Dormitories at the Nebraska State Penitentiary	Beal Slough	April 3, 1997
	97-07-320P	Antelope Commons	Antelope Creek	February 17, 1998
	96-07-222P	Magee Dam	Stevens Creek	June 27, 1996